

HIGH-TEMPERATURE TYPE FUEL CELL SYSTEM POWER GENERATING DEVICE

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Applicant: TONEN CORP

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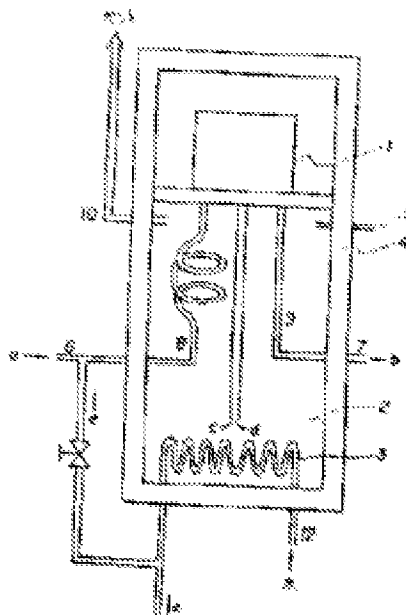
Application number: JP19900335148 19901130

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Bibliographic Fields

PURPOSE:To miniaturize the whole device by integrating and uniting a fuel cell body, a preheating chamber, a reformer, and a boiler furnace.

CONSTITUTION:A high-temperature type fuel cell body 1, a combustion chamber 2, and a boiler 3 are continuously provided, and the whole outside driving body is formed by a heat insulating layer 4 to form an unit structure in which the whole body is integrated. The residual fuel gas (c) and oxidizing agent gas (d) exhaust after generation from the fuel cell body are sent into the combustion chamber 2 in the middle, and further combusted. An excessive temperature rise by this combustion heating is cooled by the air supplied from an outside air supply pipe 5 to properly regulate the heating temperature in the combustion chamber. The feed to the fuel battery body, or hydrocarbon (a) and an oxidizing agent (b) gas such as air are guided to narrow pipes 8, 9 having large contact areas and forms excellent in heat exchange in the combustion chamber through a fuel gas inlet port 6 and an oxidizing agent gas inlet port 7, and during passing the pipes 8, 9, they are mainly preheated by the heat exchange by the combusting heat of the exhaust gas. Thus, the whole generator device can be miniaturized.



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Abstract

明細書

1.発明の名称

高温型燃料電池系発電装置

Claims

2.特許請求の範囲

1

燃料ガスと酸化剤ガスを用いる高温型燃料電池を組み込んだ高温型燃料電池系発電装置において、高温型燃料電池本体、発電後の高温型燃料電池本体から排出された残存燃料ガスと酸化剤ガスを燃焼させるための燃焼室及び燃焼室からの排出ガスを水と熱交換させてスチームを発生させるためのボイラーあるいはボイラー・ファーンネスを連設し外側躯体全体を断熱層で形成して全体一体化させたユニット化構造を有して成り、かつ炭化水素と酸化剤ガスからなるフィードがそれぞれ燃焼室内で予熱されて燃料ガス及び酸化剤ガスとして燃料電池本体に供給されることを特徴とする高温型燃料電池系発電装置。

2

燃料ガスと酸化剤ガスを用いる高温型燃料電池を組み込んだ高温型燃料電池系発電装置において、高温型燃料電池本体、発電後の高温型燃料電池本体から排出された残存燃料ガスと酸化剤ガスを燃焼させるための燃焼室及び燃焼室からの排出ガスを水と熱交換させてスチームを発生させるためのボイラーあるいはボイラー・ファーンネスを連設し外側躯体全体を断熱層で形成して全体一体化させたユニット化構造を有して成り、かつ炭化水素と酸化剤ガスからなるフィードがそれぞれ燃焼室内で予熱されるとともに、そのうちの炭化水素はボイラーから取り出されたスチームと混合されて改質処理をも施され、このように予熱あるいは予熱・改質されたフィードを酸化剤ガス及び燃料ガスとして燃料電池本体に供給されることを特徴とする高温型燃料電池系発電装置。

Specification

3.発明の詳細な説明

Specification

1.Title of Invention

high temperature type fuel cell system electrical generating equipment

2.Claim (s)

1

In high temperature type fuel cell system electrical generating equipment which installs high temperature type fuel cell which uses fuel gas and oxidant gas , Remains fuel gas and oxidant gas which are discharged from high temperature type fuel cell main body after high temperature type fuel cell main body , generating electricity water and heat exchange doing combustion chamber in order to burn, and exhaust gas from the combustion chamber connecting boiler or boiler *furnace in order to generate steam and forming outside building frame entirety with insulating layer and possessing unitization structure which entirety integration it does it becomes, At same time feed which consists of hydrocarbon and oxidant gas inside respective combustion chamber , preheating being done, high temperature type fuel cell system electrical generating equipment . which designates that it is supplied to fuel cell main body as fuel gas and oxidant gas as feature

2

In high temperature type fuel cell system electrical generating equipment which installs high temperature type fuel cell which uses fuel gas and oxidant gas , Remains fuel gas and oxidant gas which are discharged from high temperature type fuel cell main body after high temperature type fuel cell main body , generating electricity water and heat exchange doing combustion chamber in order to burn, and exhaust gas from the combustion chamber connecting boiler or boiler *furnace in order to generate steam and forming outside building frame entirety with insulating layer and possessing unitization structure which entirety integration it does it becomes, At same time feed which consists of hydrocarbon and oxidant gas inside respective combustion chamber , as child it is heated, as for the hydrocarbon among those steam which is removed from boiler beingmixed, even reforming administering, this way high temperature type fuel cell system electrical generating equipment . which designates that it is supplied to fuel cell main body preheating or preheating * feed which is improved as oxidant gas and fuel gas as feature

3.Detailed Description of the Invention

産業上の利用分野

本発明は、高温型燃料電池系発電装置に関するものである。さらに詳しくいえば、本発明は、小型化、コンパクト化が可能となり、本体装置のボリュウムと出力の効率化が計れる高温型燃料電池系発電装置に関するものである。

従来の技術

高温型燃料電池は 1000℃付近の高温で作動されることから、電極反応速度が大さいため、理論的には高出力密度化でき、他のリン酸型や熔融炭酸塩型等の燃料電池に比べ同一出力で小型化が可能であるとされているが、高温動作のため断熱や排熱の制御等の熱管理が困難であり、単に燃料電池本体のみの小型化だけでなく、発電装置全体のシステム化やシステム自体のコンパクト化が強く要望されている。

しかし、従来の発電システムの多くは、第 1 図に示すように、燃料電池本体からの高温の各排ガスをボイラー兼用ファーンエスの加熱源に用いて熱交換を行わせ、スチームを取り出すとともに、まだ余熱のある該熱交換済みの排ガスは燃料電池用の各原料ガス、特に燃料ガスの熱交換に利用したのち、系外へ排気され、このように熱交換で予熱された燃料ガスは前記ボイラーからのスチームとともに改質器でスチームクラッキング等の改質処理に付されたのち、燃料ガスとして燃料電池に供給されるが、個々の装置は別体で作られているため、システムが大型化するのが免れなかった。他方、熱交換部と燃料電池本体とを一体化したものも提案されているが〔特開平 2-234362 号公報、WH セル(米国、ウエスチングハウス社製)〕、それ以上に、例えばボイラー・ファーンエス等まで一体化してコンパクトにしたものは知られていないのが実状である。

発明が解決しようとする課題

本発明は、このような従来の燃料電池の発電システムのもつ欠点を克服し、発電システムや発電装置全体の小型化してコンパクトにすることが可能となり、本体装置のボリュウムと出力の効率化が計れる高温型燃料電池系発電装置を提供することを目的としてなされたものである。

Industrial Area of Application

this invention is something regarding high temperature type fuel cell system electrical generating equipment . Furthermore speaking in detail, as for this invention, miniaturization , compaction becomes possible, it is something regarding volume of main body equipment and the high temperature type fuel cell system electrical generating equipment which can measure making efficient of output.

Prior Art

high temperature type fuel cell from fact that it is operated with high temperature of 1000 *vicinity , electrode reaction velocity large to damage, high output densification it to be possible to theoretical , it is assumed that miniaturization is possible with same output, in comparison with other phosphoric acid type and molten carbonate type or other fuel cell , but because of high temperature actuation control or other heat control of insulating and waste heat being difficult, simply not only a miniaturization only of fuel cell main body , compaction of system conversion and system itself of electrical generating equipment entirety is demanded strongly.

But, as many of conventional electricity generating system , as shown in Figure 1 , using each exhaust gas of high temperature from fuel cell main body for heat source of boiler combined use furnace , make heat exchange do, remove steam , still exhaust gas have the excess heat said heat exchange after utilizing in heat exchange of each starting material gas , especially fuel gas for fuel cell , exhaust is done to outside the system , this way fuel gas which preheating is done is supplied to the fuel cell with heat exchange with steam from aforementioned boiler after being attached on steam cracking or other reforming with reformer , as fuel gas , but as for individual equipment because it is made in separate body , system did not escape fact that scale-up it does. integration are done also those which have been proposed other , heat exchange section and fuel cell main body , but {Japan Unexamined Patent Publication Hei 2-234362 disclosure , WHcell (United States , [uesuchinguhausu] supplied) } , above that, integration doing to the for example boiler *furnace , etc as for those which it makes compact fact that it is not known is actual condition.

Problems That Invention Seeks to Solve

this invention overcomes deficiency which electricity generating system of conventional fuel cell a this way has, miniaturization of electricity generating system and electrical generating equipment entirety does and volume of the main body equipment and can measure making efficient of output it is something which it is possible high temperature type fuel cell system electrical generating equipment where it becomes possible, to make compact , offering as object .

課題を解決するための手段

本発明者らは、高温型燃料電池系発電装置を開発するために種々研究を重ねた結果、燃料電池本体、予熱室、改質器、ボイラー・ファーンネスを一体化してユニット化することにより、その目的を達成しうることを見出し、この知見に基づいて本発明を完成するに至った。

すなわち、本発明は、燃料ガスと酸化剤ガスを用いる高温型燃料電池を組み込んだ高温型燃料電池系発電装置において、高温型燃料電池本体、発電後の高温型燃料電池本体から排出された残存燃料ガスと酸化剤ガスを燃焼させるための燃焼室及び燃焼室からの排出ガスを水と熱交換させてスチームを発生させるためのボイラーあるいはボイラー・ファーンネスを連設し外側躯体全体を断熱層で形成して全体一体化させたユニット化構造を有して成り、かつ炭化水素と酸化剤ガスからなるフィードがそれぞれ燃焼室内で予熱されて燃料ガス及び酸化剤ガスとして燃料電池本体に供給されることを特徴とする高温型燃料電池系発電装置、及び燃料ガスと酸化剤ガスを用いる高温型燃料電池を組み込んだ高温型燃料電池系発電装置において、高温型燃料電池本体、発電後の高温型燃料電池本体から排出された残存燃料ガスと酸化剤ガスを燃焼させるための燃焼室及び燃焼室からの排出ガスを水と熱交換させてスチームを発生させるためのボイラーあるいはボイラー・ファーンネスを連設し外側躯体全体を断熱層で形成して全体一体化させたユニット化構造を有して成り、かつ炭化水素と酸化剤ガスからなるフィードがそれぞれ燃焼室内で予熱されるとともに、そのうちの炭化水素はボイラーから取り出されたスチームと混合されて改質処理をも施され、このように予熱あるいは予熱・改質されたフィードガスを酸化剤ガス及び燃料ガスとして燃料電池本体に供給されることを特徴とする高温型燃料電池系発電装置を提供するものである。

本発明装置への一方のフィードとして用いる炭化水素には、例えばケロシン、ナフサ、ガソリン、LPG、プロパン、ブタン、都市ガスなどが挙げられ、特にガス状燃料が好ましい。これらの炭化水素は加熱下スチームを作用させてスチームリホーミングされ、主として水素と一酸化炭

means in order to solve problem

these inventors result of repeating various research in order to develop high temperature type fuel cell system electrical generating equipment , fuel cell main body , preheating room, integration doing reformer , boiler *furnace ,discovered fact that it can achieve object , by unitization doing,this invention reached to completion on basis of this knowledge.

As for namely, this invention, in high temperature type fuel cell system electrical generating equipment which installs high temperature type fuel cell which uses fuel gas and oxidant gas , Remains fuel gas and oxidant gas which are discharged from high temperature type fuel cell main body after high temperature type fuel cell main body , generating electricity water and heat exchange doing combustion chamber in order to burn, and exhaust gas from the combustion chamber connecting boiler or boiler *furnace in order to generate steam and forming outside building frame entirety with insulating layer and possessing unitization structure which entirety integration it does it becomes, At same time feed which consists of hydrocarbon and oxidant gas inside respective combustion chamber , preheating being done, in high temperature type fuel cell system electrical generating equipment which installs high temperature type fuel cell system electrical generating equipment , which designates that it is supplied to fuel cell main body as fuel gas and oxidant gas as feature and the high temperature type fuel cell which uses fuel gas and oxidant gas , Remains fuel gas and oxidant gas which are discharged from high temperature type fuel cell main body after high temperature type fuel cell main body , generating electricity water and heat exchange doing combustion chamber in order to burn, and exhaust gas from the combustion chamber connecting boiler or boiler *furnace in order to generate steam and forming outside building frame entirety with insulating layer and possessing unitization structure which entirety integration it does it becomes, At same time feed which consists of hydrocarbon and oxidant gas inside respective combustion chamber , as preheating it is done, as for hydrocarbon among those steam which is removed from boiler being mixed,even reforming administering, this way it is something which offers high temperature type fuel cell system electrical generating equipment which designates that it is supplied to fuel cell main body preheating or preheating * the feed gas which is improved as oxidant gas and fuel gas as feature.

You can list to hydrocarbon which it uses as feed of one side to this invention equipment , for example kerosine , naphtha , gasoline , LPG , propane , butane , city gas etc, especially gaseous fuel is desirable. These hydrocarbon under heating operating, steam reforming are done steam , are improved to

素等へ改質される。

また、他方のフィードガスとして用いる酸化剤ガスは、通常空気である。

本発明装置における外側躯体は断熱層だけのものの他、適宜加熱あるいは冷却して熱管理調整しうる構造のものであってもよい。

実施例

本発明の発電装置の 1 例を図面にしたがって説明する。発電装置は、第 2 図に示すように、全体は高温型燃料電池本体 1、燃焼室 2 及びボイラー 3 (あるいはボイラー・ファーンレス) を連設し、かつ外側躯体全体を断熱層 4 で形成して全体を一体化させたユニット構造のものである。この中間の燃焼室 2 内へは燃料電池本体から発電後排出される残存燃料ガス c と酸化剤ガス d が送り込まれてさらに燃焼される。この燃焼加熱による過昇温は外気供給管 5 より供給される空気による冷却により燃焼室内の加熱温度は適宜調整される。燃料電池本体へのフィードすなわち炭化水素 a と空気等の酸化剤ガス b は、燃焼室内へ燃料ガス入口 6 及び酸化剤ガス入口 7 から蛇管状、ジグザグ状、スパイラル状などの接触面積が大きく、熱交換の良好な形態の細長い管 8, 9 中に導入され、この管を通過する間に主として上記排出ガスの燃焼熱による熱交換で予熱され、場合によりそのうちの上記炭化水素 a は後述するようにボイラー 3 から取り出されたスチーム e と混合されて改質処理を施すこともできる。このように予熱あるいは予熱・改質されたフィードは前記管 8, 9 から接続部を介し燃料ガスと酸化剤ガスとして燃料電池本体 1 へ供給される。これら燃料ガスと酸化剤ガスの供給方向は、第 3 図の燃料電池の集合様式に示されるように、互いに交差、特に直交させるのが好ましい。

さらに、燃焼室からのまだ余熱のある排出ガスはボイラーあるいはボイラー・ファーンレスへ蛇管状、ジグザグ状、スパイラル状などの接触面積が大きく、熱交換の良好な形態のボイラー (パイプスチール) 内の水と熱交換してスチームを発生させたのち、排気口 10 から排出される。パイプスチール形態等のボイラーは 1 個だけには限られず、多数個設けることができる。また、排ガスは他の熱回収システムに利用できる。このよ

hydrogen and carbon monoxide etc mainly.

In addition, oxidant gas which it uses as feed gas of other is the air usually.

outside building frame in this invention equipment other than those just of insulating layer, appropriately heating or cooling, or is good even with those of the structure which it can heat control and adjust.

Working Example (s)

Following 1 example of electrical generating equipment of this invention to drawing, you explain. As for electrical generating equipment, as shown in Figure 2, as for entirety high temperature type fuel cell main body 1, combustion chamber 2 and boiler 3 (Or boiler *furnace) are connected, at same time outside building frame entirety is formed with insulating layer 4 and it is something of unit structure which the entirety integration is done. Remains fuel gas c and oxidant gas d which after generating electricity are discharged from fuel cell main body being sent to inside combustion chamber 2 of this intermediate, furthermore it burns. With this combustion heating as for excess temperature rise from external air supply hose 5 as for heating temperature inside combustion chamber it is appropriately adjusted with air which is supplied by cooling. As for feed namely hydrocarbon a and air or other oxidant gas b to fuel cell main body, to inside combustion chamber helical tube condition, zigzag shape, spiral or other contact area is large from fuel gas inlet 6 and oxidant gas inlet 7, tube it is introduced in 8 where satisfactory shape of heat exchange is long and narrow and 9, while passing this tube, with heat of combustion of above-mentioned exhaust gas preheating it is done with heat exchange mainly. Above-mentioned hydrocarbon a among those as mentioned later, steam e which is removed from boiler 3 being mixed, can also administer the reforming from when. This way preheating or preheating *, feed which is improved through connection portion from aforementioned tube 8 and 9, is supplied to the fuel cell main body 1 as fuel gas and oxidant gas. As for these fuel gas and feed direction of oxidant gas, as shown in assembly pattern of fuel cell of Figure 3, mutually intersection, it is desirable especially to cross.

Furthermore, after exhaust gas which has still excess heat from combustion chamber helical tube condition, zigzag shape, spiral or other contact area is large to boiler or boiler *furnace, the water and heat exchange inside boiler (pipe steel) of satisfactory shape of heat exchange doing, generating steam, it is discharged from the exhaust opening 10. pipe steel shape or other boiler is not limited by just 1, large number it is possible to provide. In addition, it can utilize exhaust gas in other heat recovery system. steam which is

うにして取り出されたスチームの少なくとも一部は前述したように燃料ガス中へ導入される。ボイラー内の水のレベルは給水管 12 より水を補給することにより適宜調整される。

この結果、第 1 図におけるレイアウトよりも装置寸法は小さくすることができ、さらに無駄な放熱は約 20%削減することができる。

発明の効果

本発明は、発電装置全体の小型化が可能となり、装置の単位容積当りの出力の増大による効率化が計れ、高温の燃焼排ガスのもつ熱エネルギーによる原料ガスの予熱や水との熱交換によるスチーム取り出し、さらに該スチームをハイドロカーボン等の原料燃料ガスと混合することで上記燃焼排ガスによる予熱の際に同時にスチームリヒーミング等による改質も計れ、効率的な熱管理及び燃料調製が可能となるなど多くの顕著な効果を奏する。

Drawings

4.図面の簡単な説明

第 1 図は、従来の燃料電池を用いた発電装置の 1 例を示す説明図、第 2 図は、本発明の発電装置の 1 例の断面説明図、第 3 図は、本発明に用いられる燃料電池の集合様式の 1 例の斜視説明図である。

特許出願人 東燃株式会社

復代理人 阿形明

removed this way at least part as mentioned earlier, is introduced to in fuel gas . level of water inside boiler is adjusted appropriately by replenishing water from water supply pipe 12.

this result, as for equipment dimension it is possible in comparison with the layout in Figure 1 , furthermore approximately 20% can reduce wasteful heat release to make small.

Effect of Invention

As for this invention, miniaturization of electrical generating equipment entirely becomes possible, making efficient measures with increase of output of per unit volume of equipment , with thermal energy which combustion exhaust gas of high temperature has with preheating of starting material gas and heat exchange of water steam to remove, furthermore by the fact that said steam is mixed with hydrocarbon or other starting material fuel gas with above-mentioned combustion exhaust gas assure simultaneously to case of preheating also the improvement with such as steam reforming , efficient heat control and fuel manufacturing possibility such as become have many marked effects.

4.Brief Explanation of the Drawing (s)

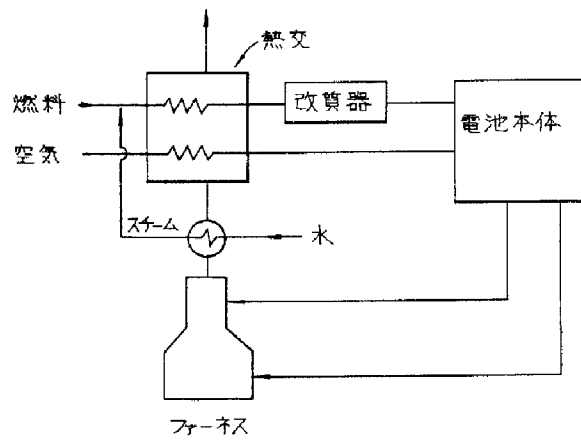
As for Figure 1 , as for explanatory diagram , Figure 2 which shows 1 example of electrical generating equipment which uses conventional fuel cell , as for cross section explanatory diagram , Figure 3 of 1 example of electrical generating equipment of this invention , it is a strabismus explanatory diagram of 1 example of assembly pattern of fuel cell which is used for this invention .

patent applicant Tonen Corporation (DB 69-057-5139)

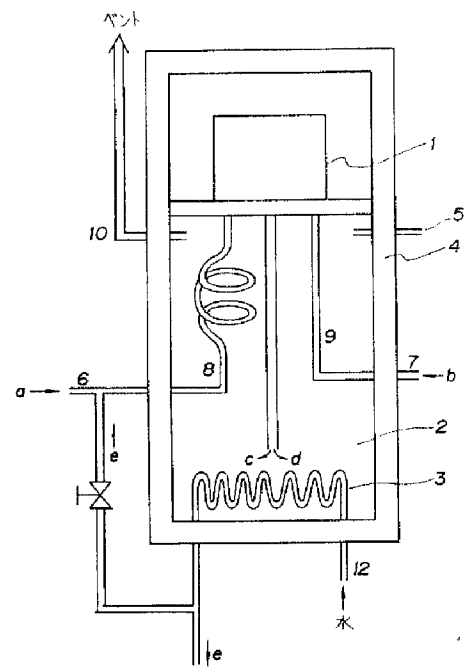
Returning/repeating representative Agata discernment

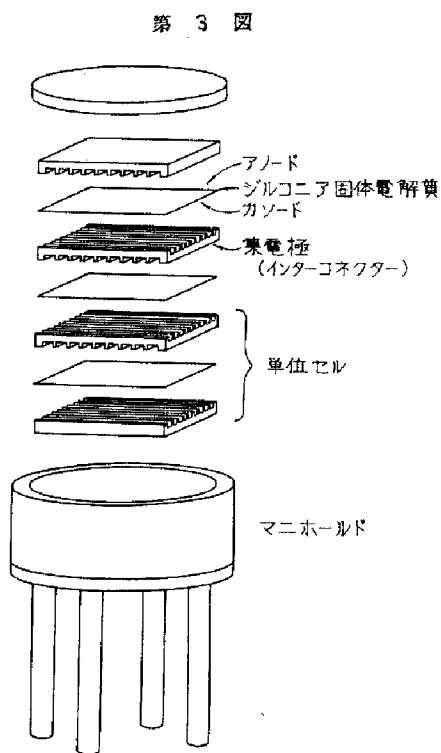
図面の浄書

第 1 図



第 2 図





(ほか 1 名)図面の浄書

第 1 図

第 2 図

第 3 図

手続補正書

平成 3 年 1 月 18 日特許庁長官 植松敏殿

1.

事件の表示

平成 2 年特許願第 335148 号

2. 発明の名称

高温型燃料電池系発電装置

3.

補正をする者

事件との関係 特許出願人

Kiyoshi book of (Other 1 person) drawing

Figure 1

Figure 2

Figure 3

filing amendment

Uematsu Satoshi 1991 January 18 day Japan Patent Office directors

1.

Indication of incident

1990 Japan Patent Application 335148 numbers

2. Title of Invention

high temperature type fuel cell system electrical generating equipment

3.

Person who does correction

Related patent applicant of incident

東京都千代田区一ツ橋一丁目 1 番 1 号

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6.

補正命令の日付 自発

7.

補正の対象 図面

8.

補正の内容 別紙のとおり (浄書)

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6.

date spontaneousness of correction command

7.

object drawing of correction

8.

Sort of content separate paper of correction (Kiyoshi book)